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First Chromosome Records for the Superfamily Ceraphronoidea and New Data for Some Genera and Species of Evanioidea and Chrysididae (Hymenoptera: Chrysidoidea)

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Abstract.—The first data on chromosome numbers and karyotypes of the Ceraphronoidea (Megaspilidae) are presented. New data is presented for one species of Gasteruptiidae (Evanioidea) and 3 species in two genera of Chrysididae increasing our knowledge of karyotypes in these families. Phylogenetic implications of these data are briefly discussed.

Despite intensive chromosome study of parasitic wasps including the less derived groups of aculeate Hymenoptera during the last few years (see Gokhman and Quicke 1995 for review), some entire families and even superfamilies still remain totally or largely untouched by karyological investigation. The superfamilies Ceraphronoidea, Evanioidea and Chrysidoidea are among the latter. There are no data at present on chromosomes of these groups except for one gasteruptiid *Gasteruption breviterebrae* (listed under *Trichofoenus,* a junior synonym of *Gasteruption*), and one chrysidid, *Omalus djozanus hondonis* (Hoshiba and Imai 1993), and two chrysidoids from the family Bethylidae (Gokhman and Quicke 1995; table 1). In Hoshiba & Imai a chromosome number for a *Trichofoenus* sp. (a junior synonym of *Gasteruption*) is listed *loc. cit.* as a sphecid under the Larrinae, but this was apparently a mistake and Hoshiba (pers. comm.) has kindly had the specimen, identified as *Gasteruption breviterebrae* Watanabe. We have studied for the first time chromosome numbers and karyotype of the family Megaspilidae (the first records for the superfamily Ceraphronoidea), and a second species of *Gasteruption* and three species in two genera of Chrysididae for which family there was previously only one published karyotype. Chromosome preparations were obtained from adult wasps collected from the wild at Silwood Park, Berkshire, U.K., during May-July 1995. Preparations were made according to the previously described protocol (Gokhman and Quicke 1995). Chromosomes were subdivided into four groups—metacentrics (M), submetacentrics (SM), subtelocentrics (ST) and acrocentrics (A) following Levan *et al.* (1964) and Imai *et al.* (1977). Voucher specimens are deposited in the Natural History Museum, London.

RESULTS

Ceraphronoidea: Megaspilidae

Dendrocerus carpenteri (Curtis). 2n = 18 (4M + 8SM + 6ST); NF = 36 (Fig. 1a). All chromosomes are obviously two-armed. Two pairs of metacentrics differ notably in size, the second is the smallest chromosome in the set. The submetacentric chromosomes show a continuous gradation in length. The third pair of subtelocentrics is much shorter than the other two.

Evanioidea: Gasteruptiidae

Gasteruption breviterebrae (Watanabe). 2*n* = 28 (4M + 24A)

Table 1. Chromosome numbers in the Ceraphronoidea, Evanioidea and Chrysidoidea

Taxon	n*	2n*	Reference
Ceraphronoidea			
Megaspilidae			
Dendrocerus carpenteri (Curtis)	9	18	present paper
Evanioidea			
Gasteruptiidae			
Gasteruption breviterebrae Watanabe	*28*	14	Hoshiba & Imai 1993
Gasteruption jaculator (L.)	*16*	32	present paper
Chrysidoidea			
Bethylidae			
Epyris niger Westwood	*14*	28	Gokhman and Quicke 1995
Laelius utilis Cockerell	10	20	Gokhman and Quicke 1995
Chrysididae			
Chrysis viridula L.	21	42	present paper
Hedychridium ardens (Coquebest)	*?19*	?38	present paper
H. roseum (Rossi)	*19*	38	present paper
Omalus djozanus hondonis (Tsuneki)	19	*38*	Hoshiba and Imai 1993

* In papers which only quote n or 2n, the other value has been surmised and is given in italics.

Gasteruption jaculator (L.). $2n = 32$ (8M + 8SM + 8ST + 8A); NF = 56 (Fig. 1b). Four pairs of acrocentrics were found in the karyotype. First pair of metacentric chromosomes is obviously larger than the others, and the last pair of submetacentrics is notably shorter than the preceding ones.

Chrysidoidea: Chrysididae

Hedychridium roseum (Rossi). $2n = 38$ (6M + 12SM + 10ST + 10A); NF = 66 (Fig. 1c). Five pairs of acrocentric chromosomes are present in the karyotype. The last pairs of meta- and submetacentrics are obviously shorter than the other chromosomes of their respective types.

Hedychridium ardens (Latreille). $2n \approx 38$ A single metaphase plate with approximately 38 chromosomes was also found in this species.

Chrysis viridula L. $2n = 42$

DISCUSSION

The above results, which are summarized in Table 1 and Fig. 1, provide new information about chromosomes of various hymenopteran taxa that may be of use in elucidating phylogenetic relationships, though at present too little is known about the variation in many families and superfamilies to draw any firm conclusions. Both the Ceraphronoidea and Evanioidea are currently believed to belong to the same clade which forms a sister group to the remaining Apocrita (Rasnitsyn 1988). Gokhman and Quicke (1995) hypothesised that the plesiomorphic haploid chromosome number in parasitic Hymenoptera (and therefore in the Apocrita as a whole) is likely to have been greater than 7, and most probably about 10 or 11. This agrees quite well with the value n=9 found for the megaspilid, *Dendrocerus carpenteri*. The considerably higher n values in the *Gasteruption* species may represent a synapomorphy for the family, but the interspecific differences suggest that karyology man also be useful in species differentiation in this group. As for the Chrysidoidea, the higher chromosome numbers found in the Chrysididae compared with the two bethylids for which data are available, may represent a synapomorphy for the nominative family (see Brothers and Carpenter 1993). Of the chrysidid genera investigated to date, *Hedychridium* and

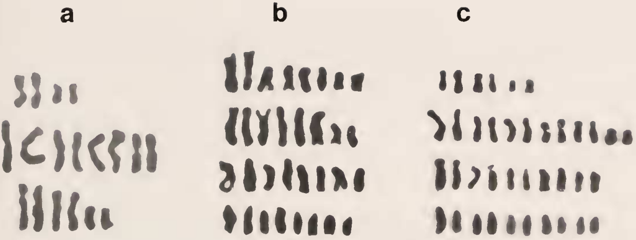

Fig. 1. Karyograms of the Ceraphronoidea, Evanioidea and Chrysidoidea. a, *Dendrocerus carpenteri* (Curtis); b, *Gasteruption jaculator* (L.); c, *Hedychridium roseum* (Rossi).

Omalus, both characterised by having $n=19$, belong to the Omalini, whereas the higher value of $n=21$ found for *Chrysis* (Chrysidini) may be an autapomorphy.

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